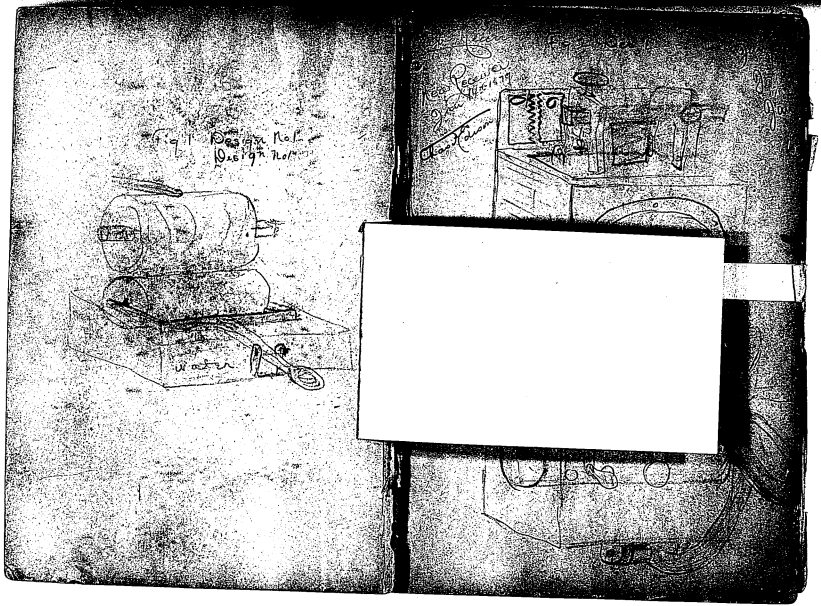
Menlo Park Notebook #24 [N-79-01-14]

This notebook covers the period January 1879-January 1880. The entries are by Edison, Charles Batchelor, Francis Upton, John Kruesi, and Charles P. Edison. The name of John Ott appears occasionally as a witness. Most of the material relates to electric lighting experiments. Included are drawings of lamps; calculations and drawings of generators; and calculations and notes by Kruesi on the design of dynamo machines, numbers 5-10. There are also notes and drawings of the telephone, including a patent office model; a draft letter by Edison to the Scientific American about the telephone; notes by Kruesi on equipment for the Edison Ore Milling Co., Ltd.; notes and drawings by Kruesi of shafting and belting for the extension of the machine shop; and notes by Batchelor on things to be done. The label on the front cover is marked "Telephone Sketches." The book contains 280 numbered pages.

Blank pages not filmed: 60-61, 66-71, 108-109, 112-113, 136-139, 154-185, 200-277.



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BOARD OF PATENT CONTROL,
120 BROADWAY, NEW YORK.
GENERAL ELECTRIC
, 189

Fig 3 Rev 1

New edition
gamma 14th 1977
Chas. F.

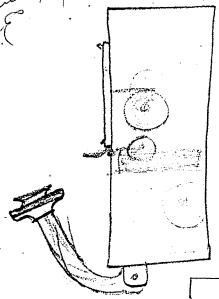
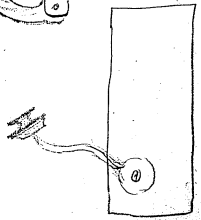


Fig 4 Rev 1



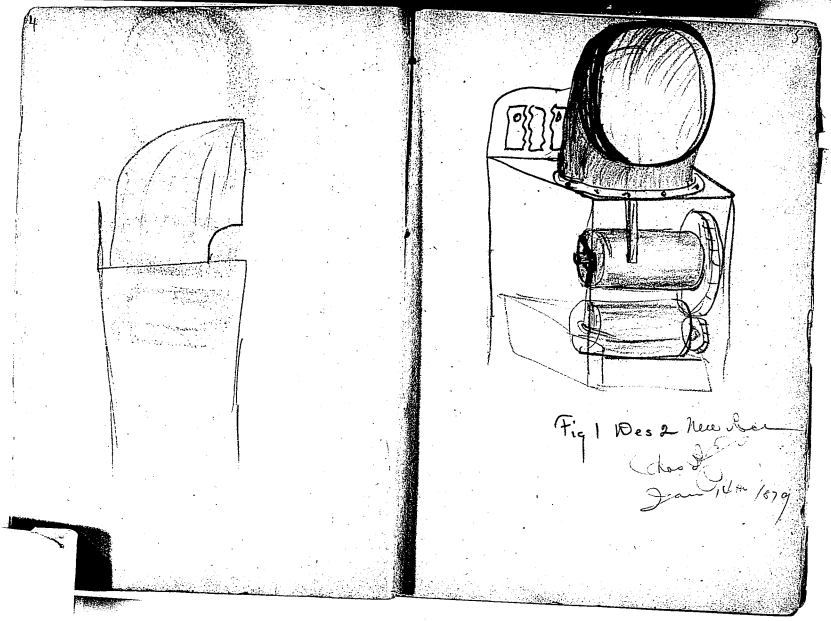


Fig 1 Des 2 Nees Ree
Jan 11th 1879

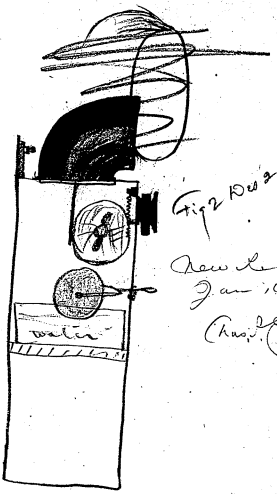


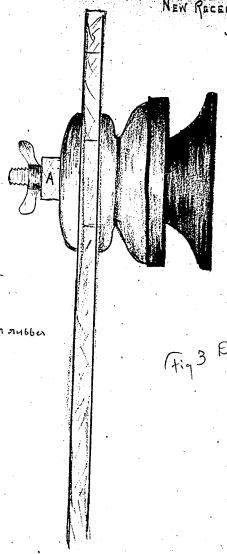
Fig 2 Duo

Jan 14th 1879

8

9

New Receiver
Jan 14th 1879
Crookes

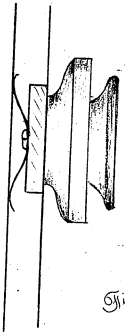


A - gum rubber washer

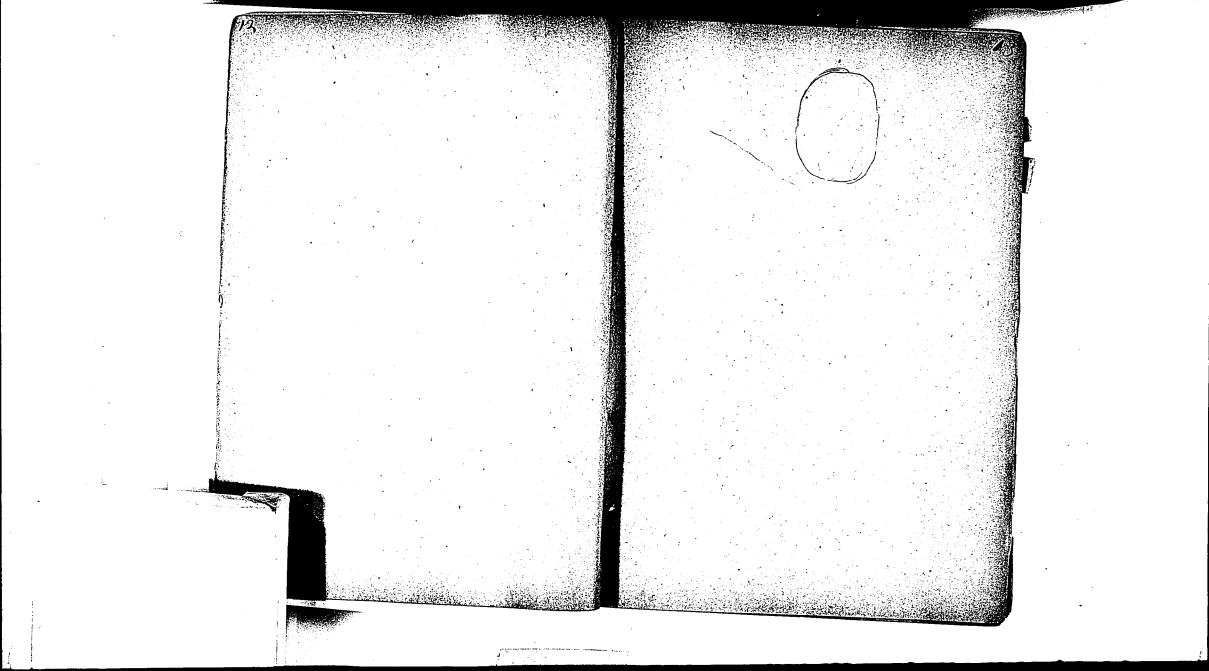
Fig 3 Doc 2

7

New Secretion
Jan 14th 1879
Chas. S. Pierson



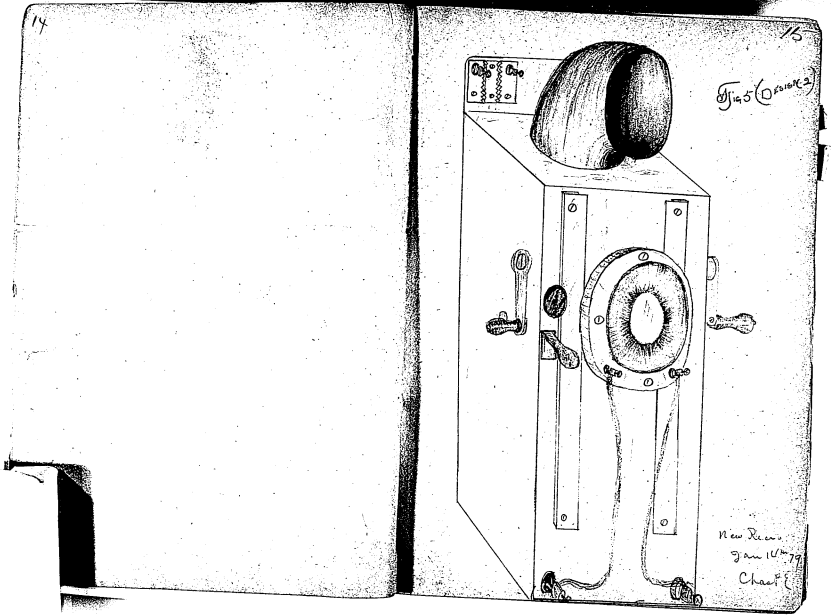
Thigh & Buttock Mg 2d



14

15

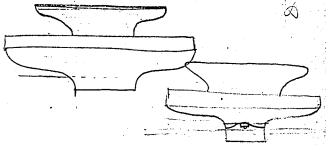
Fig 5 (Obverse)



New Rieme
Jan 14th 79
Chas F

16

Menlo Park N.J.
June 14th 1879
Thos. A. Edison



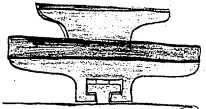
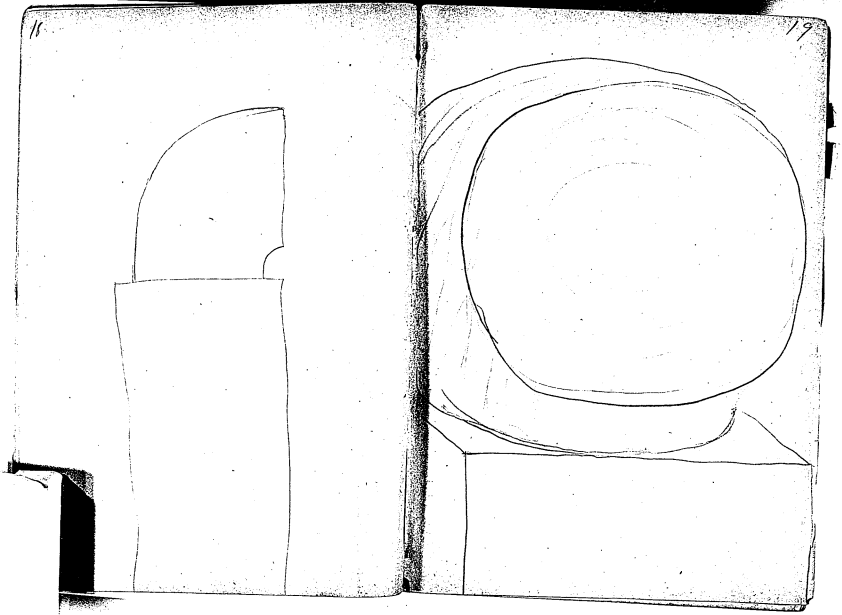


Fig 6 (Rec'd)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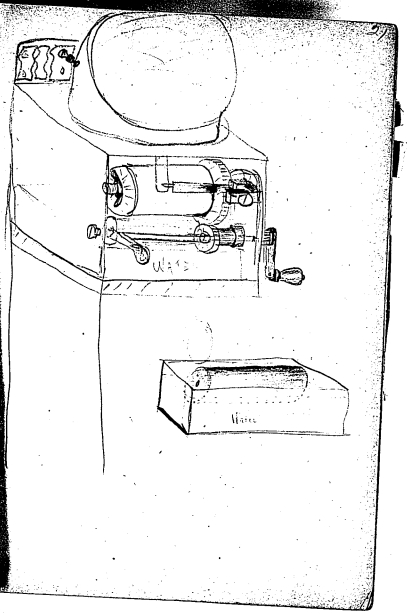
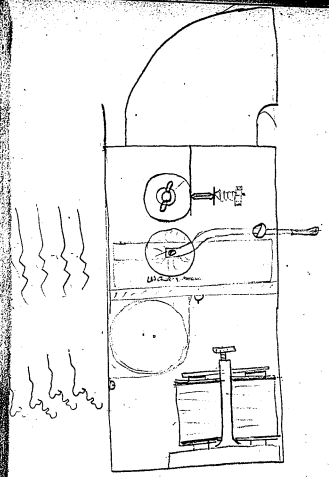
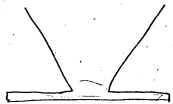
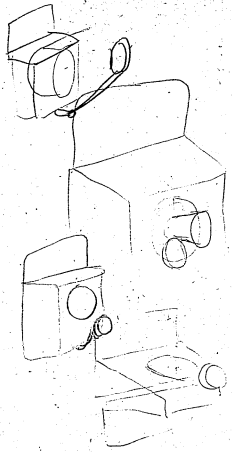
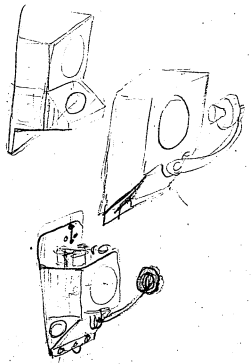

Water



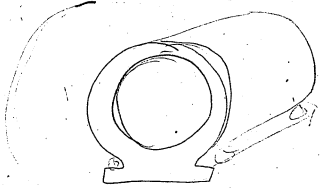


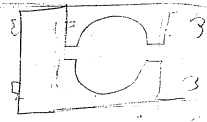




Pages 31 to 48
Explosive Shell Fuze
Investigation

No 1

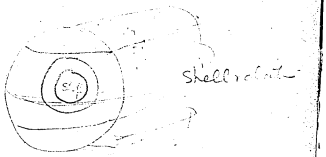




No 2.

hold the fixed magnet still & rotate the wire,

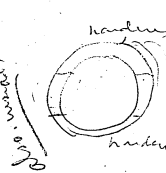
No 3.



No 4.

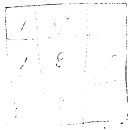
rotate ~~axis~~ wire ~~only~~ & needle + time together —

make a ring of permanent magnets

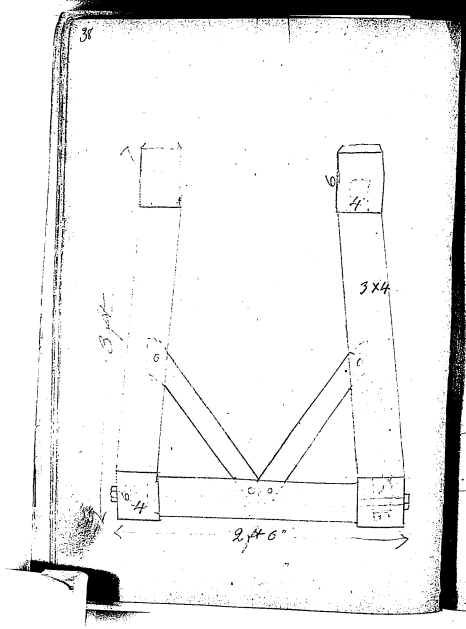


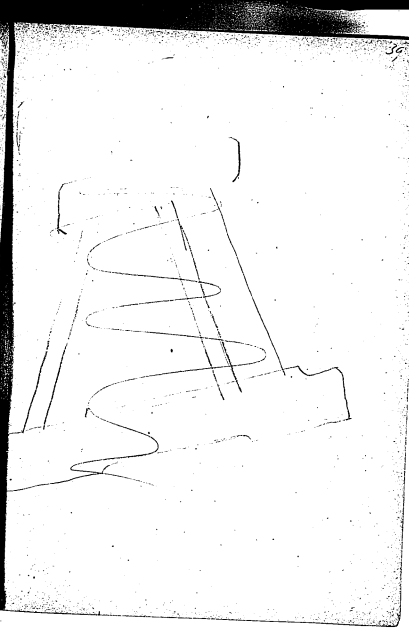
Cylinder steel =
1/2 5-

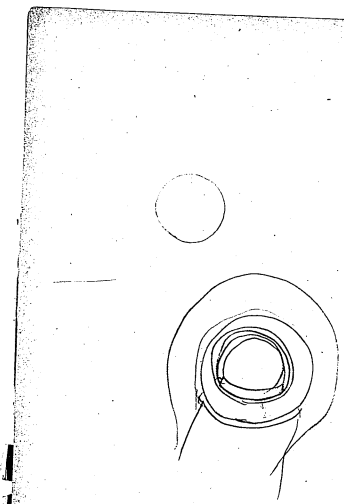
Rotate wire + cylinder

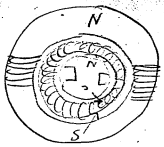


Write Harris for Johnsonhill 37
Write Johnson
Write Fullerwinds Shire. Conf
See Parker. Can he made 7
Gaffer Wade


4"
3x4
4
C.L.O.
2'-4 6"



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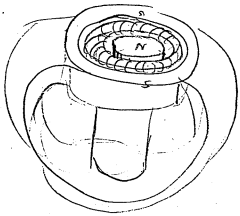
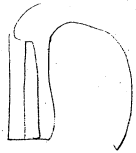
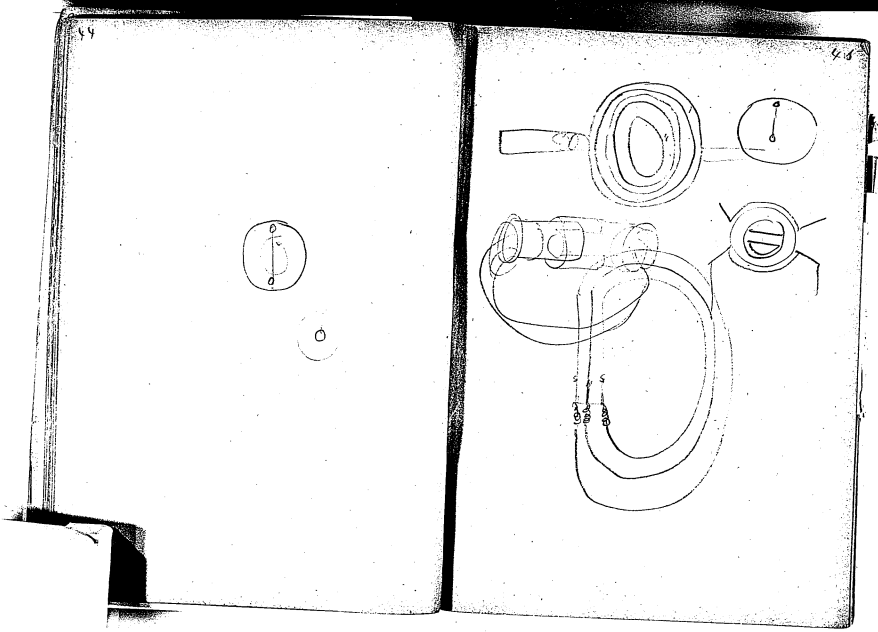
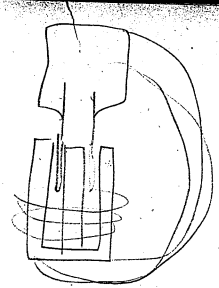
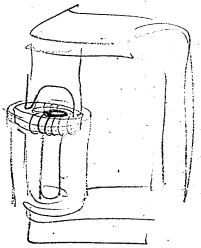
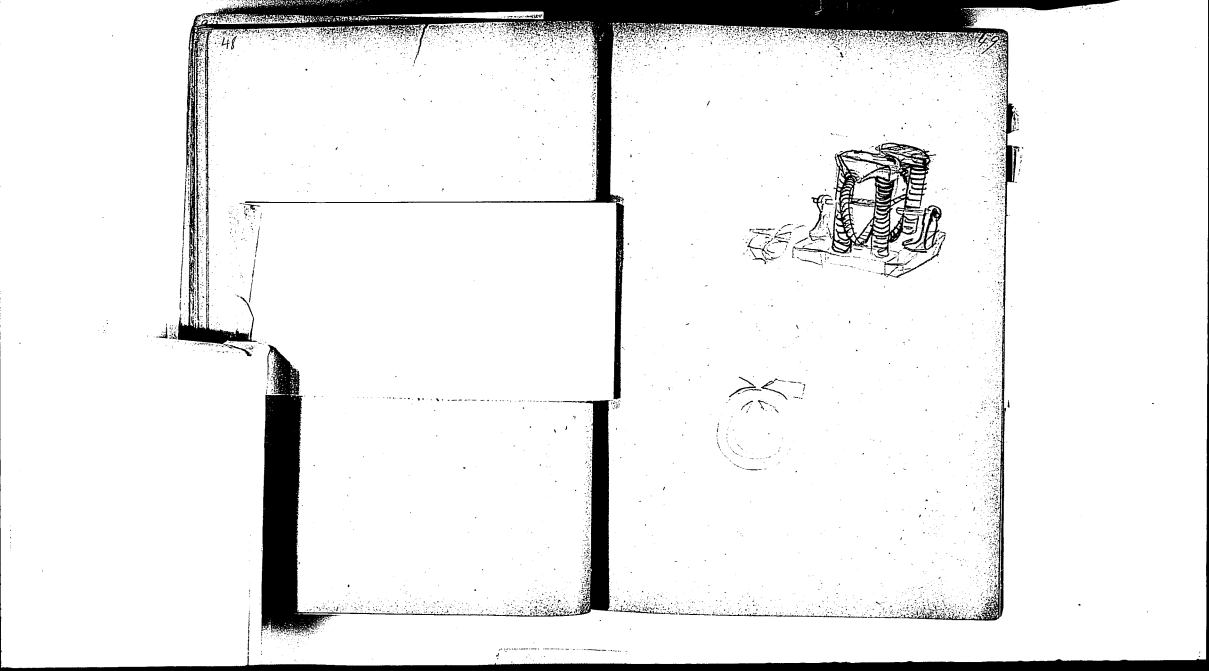

N
S

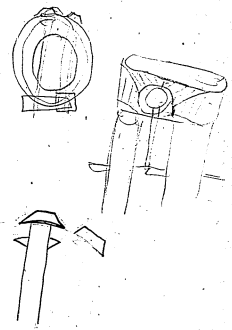


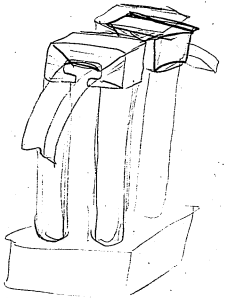


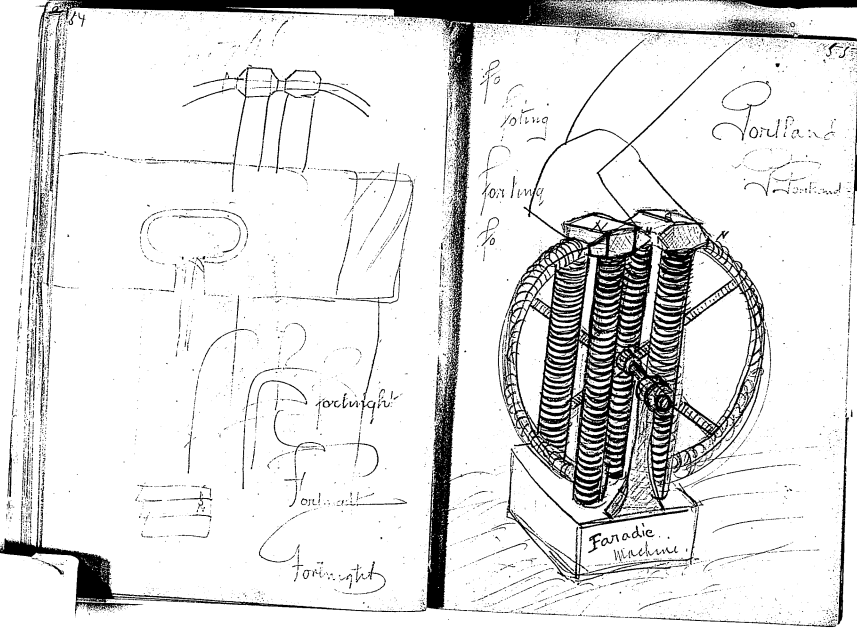


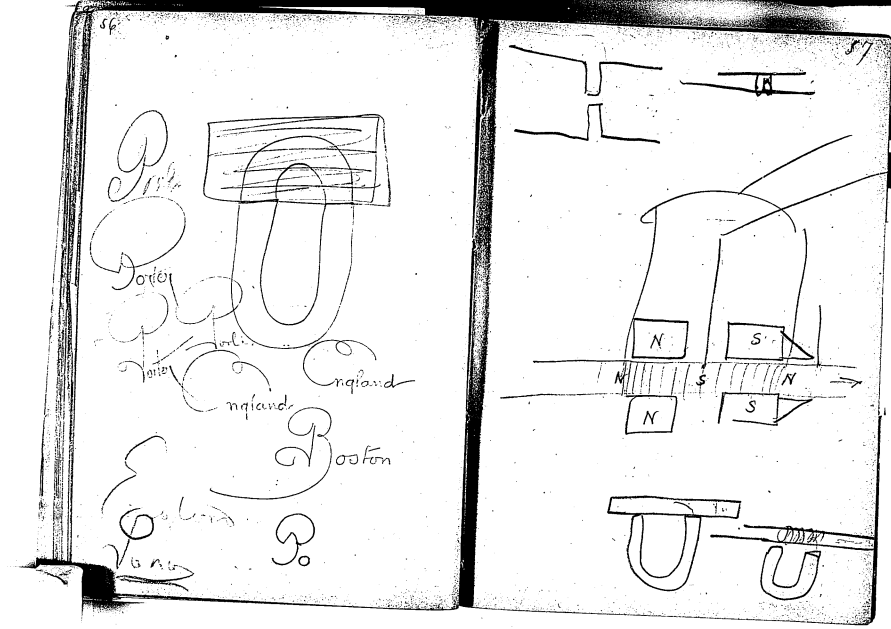









Portugal
Faradic
Machine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S
N
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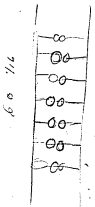
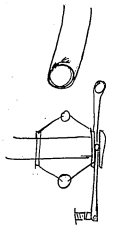
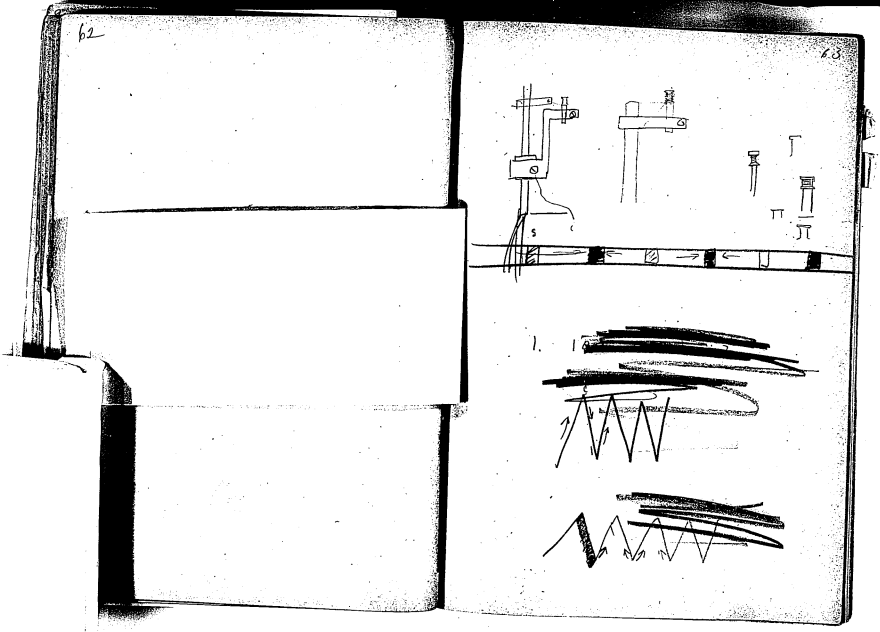
58

59



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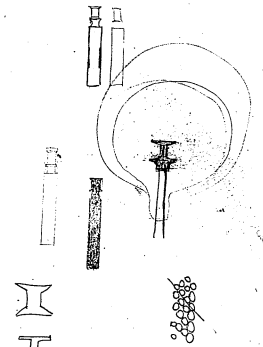
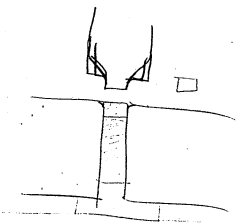
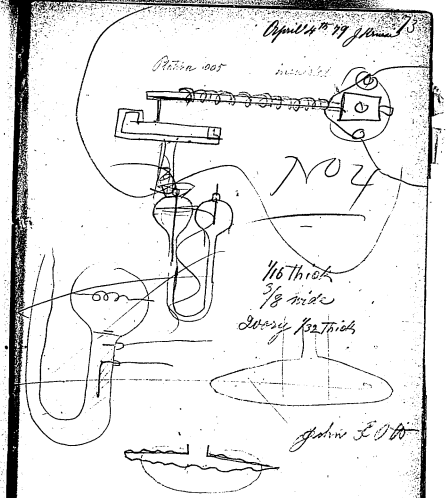
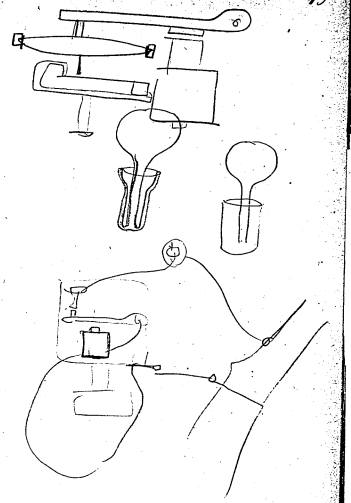
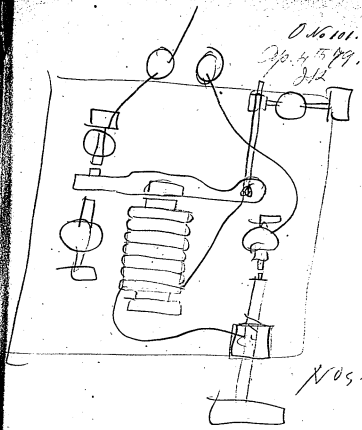


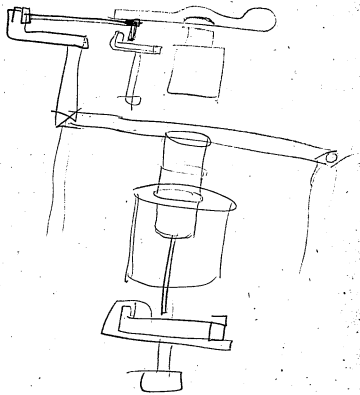



Platina wire
No 4
1/16 Thick
3/8 wide
2 Brass Rod Thick
Glass Tube





2 layers



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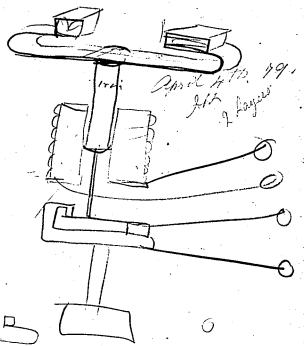
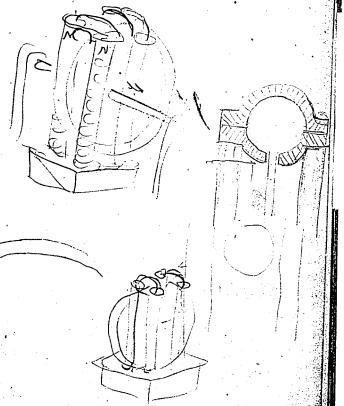


No 6a

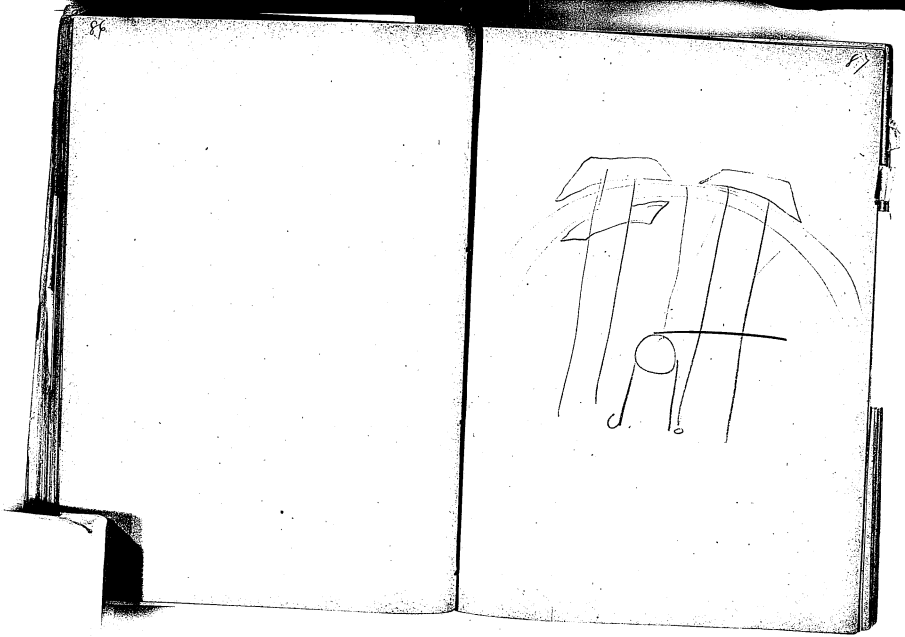
April 4th 59
JK

Model

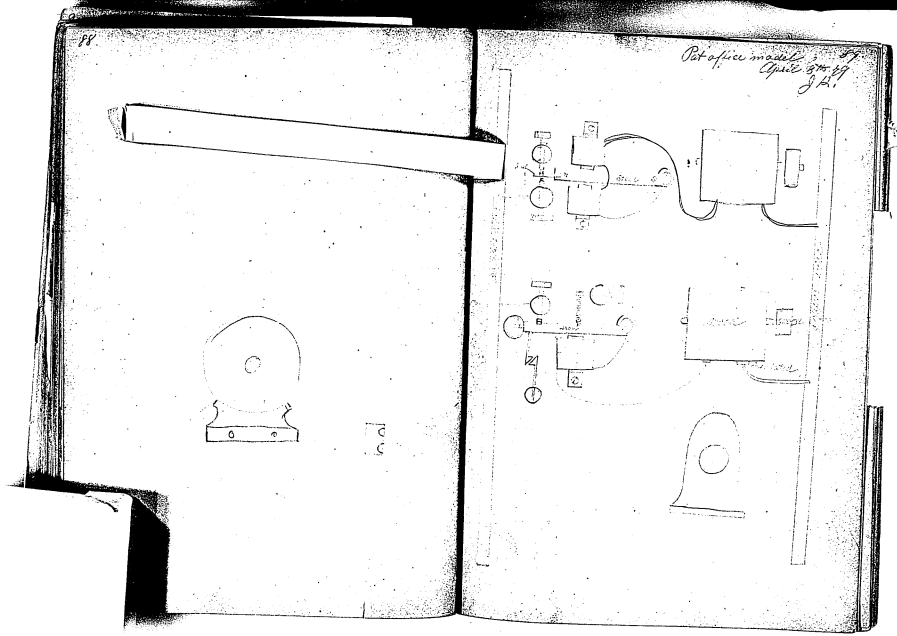


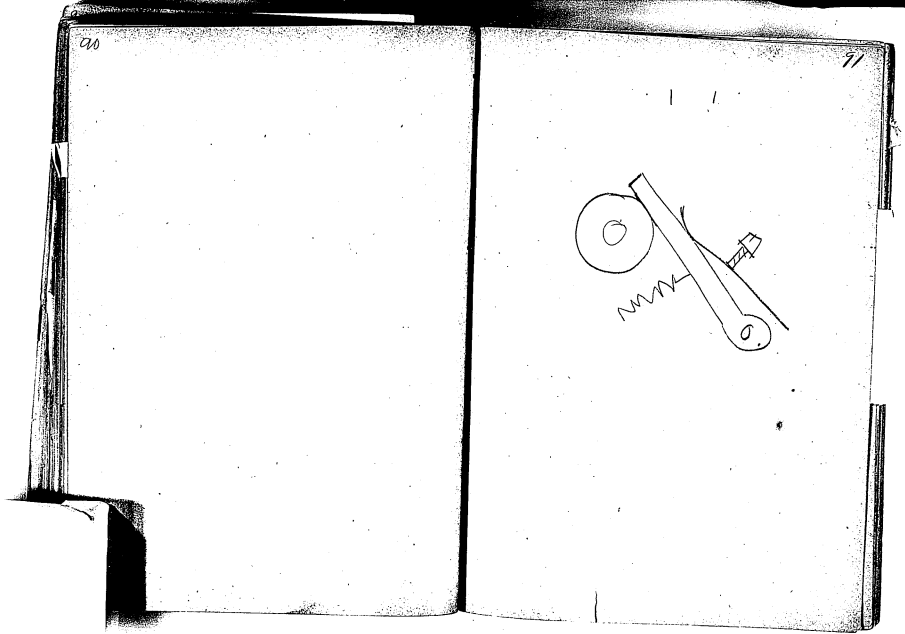
To the Editor of the S A.

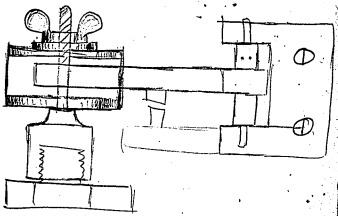
The Righi telephone which you describe and illustrate in your journal of March 22 1879 ~~is precisely the same apparatus was introduced after [illegible] which~~ is exactly similar as the one I first introduced in 1877. ~~As~~ When Prof Righi first observed his telephone Count Du Moncel called the attention of the academy of sciences to the exact similarity between the two.

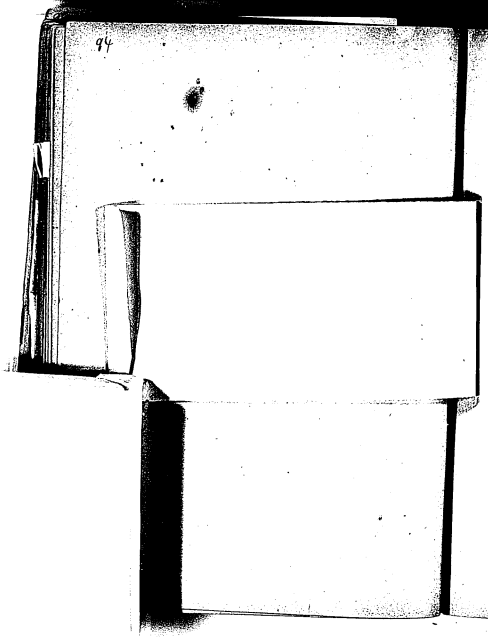


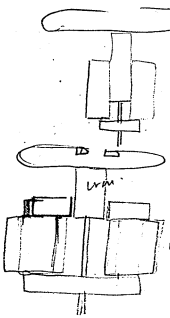
Post office model
Opened 9th Mr 89
J.P.







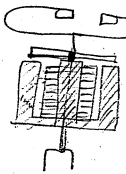




First already made

2nd
17 wire 3 Pairs

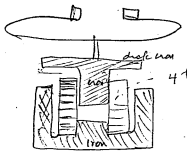
Over



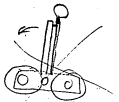
disk of iron
3 layers
N° 17 wire.

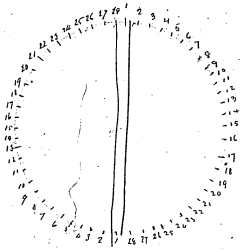
98

99

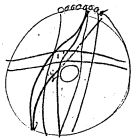


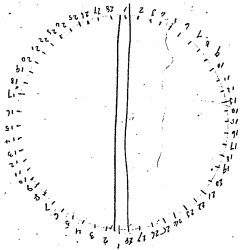
- 4 Pages no 17





23 feet 2





38
49
342
152
1862 = 155
10
310
155
140 | 1860 = 13
460
420

484
3
1452

1255 | 118 1452
1225
1452
118
11816
1452
1452
1225 | 1227336 = 140
1225
4883

49 | 400 9
392

16240
9
1680

9 | 38 4.2
36

38 inches of wire to one turn
49 coils

Volt 10 ⇒ 1 Weber
10

9)11 (1.2
9
20
18 Volt

8)12 (1.5 w
8
40

7)14 (2.

6)20 (3.3

5.7)30 (5.2 Webers
285
150

5,55)40 (1,6021
5,55 .7443
.8578

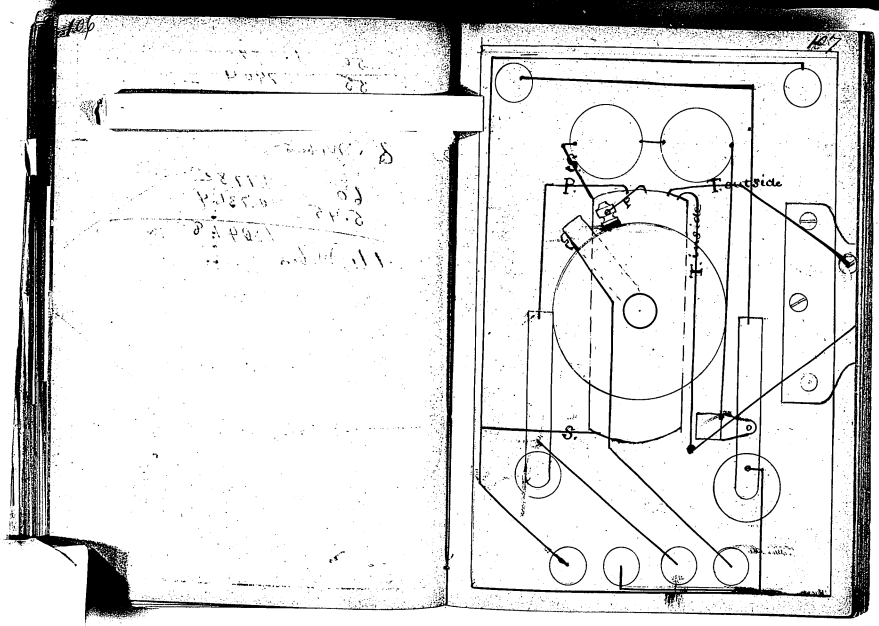
7.2 Webers

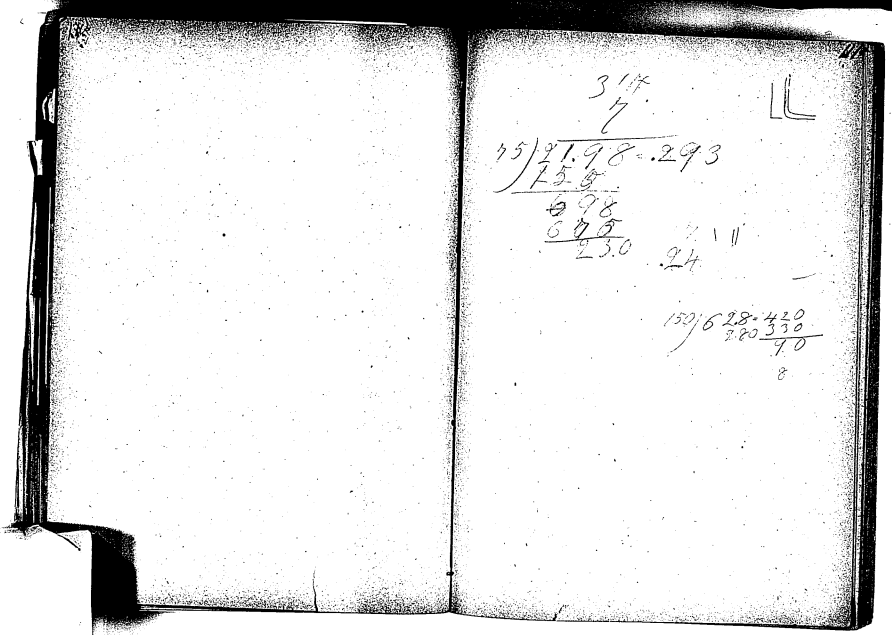
50 1.6990
55 .7404
.9586

8. Webers

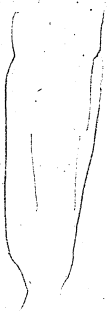
60 1.7782
5.45 .7364
1.0418

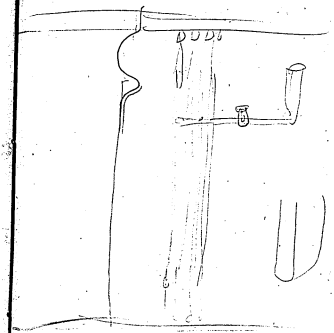
11. Webers

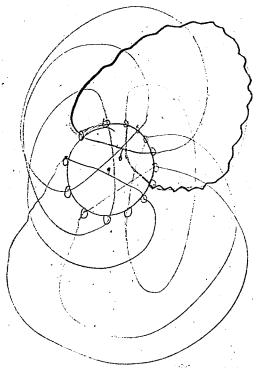

P.
F. extérieur
F. intérieur
S.


3 1/4
7
45)13.98 .293
135
98
90
8
2.30 .24
150)628.420
600
280
270
120
8

No sir they did not come on.







Connecting wire,

2.38 –

2nd least	1st least	3rd least
114	49	37
108	38	26
103	24	9
96	32	20
83	51	39
77	65	53
64	51 1/2	39 1/2
51	37	25
37	21	9
	21	9
	37	25
	48	36
	64	52
	77	65
	88	77
	99	87
	106	94

112	100
116	104
118	106
118	106
116	104
112	100
107	95
99	87
92	80
82	70
71	59
58	46
44	32
29	17
14	2
31	19

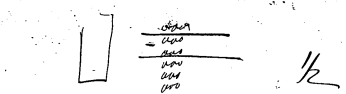
46. — 34
56. 44.
71 59
83 71
94
107
114
117
118
117
114 —

9.5 inches bore of

Inside diameter of iron 6.25 inches
8.58

Outside

9.50
8.58
.920



1/2

1/4 1/12 9/12

3/4 Ohm

62 .000 3/4

130
40
170
920 92

17)92 (5.4
85
70

1/5.4

5.4/6 = 9

124

$\frac{920}{460}$ 5 $\frac{1}{2}$

$\frac{65}{20}$ $\frac{1}{12}$

$\frac{85}{}$

$\frac{460}{85} = \frac{92}{17} = 5.4$

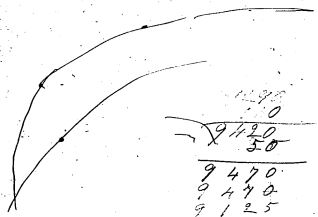
$\frac{6}{5.4} = .9$

9

675

137.68 ft pr. stone

125



1 stone 37.190 inches

3

111.57

75

36

1.27

4) 5.07

12) 8367.65 - 1374 697.3

116 688 0

87 9.300

36

2323) 697.3 = 3

6969

With speed Dia of smallest

Constant 5400

12)125.000 = 104.060

21

30

5400 | 104.0600 = 19

5400

5007

21

6

36

24

2200 | 16.70

8 : 3

80

14

2200

383

6600

17600

6600

5400 | 8426.00 = 160.5

3021

216

2200

383

6600

17600

6600

37.19

36

6

16

24

2200

24

8800

4400

528.00

383

158400

422400

158400

5400 | 202224.00 = 37

162

402

54 | 52800 | 9

432

1 60 ft. 3½ inch Shafting with 1-3½" Couplers
3" shafting in Shops
2 hangers 30" drops - for 3½" Shaft in Shops
1 — pulley 60 diam. for 24" belt on 3½" "

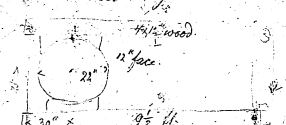
5 hangers 26" drops - for 3½" Shaft.
26 ft. 3½" Shaft.
1 — pulley. 36" diam. for 24" belt on 3½" Shaft
10 — " 32" " " 5" " " 3½" "
1 — " 31" " " 12" " on 3" Shaft.
10 or 5 — " 32" " " 5" " " 3" "
20 ft. 3" Shaft. with

5 — 1" - 2'-9" long bolts for trusses
10 - ⅞" - 1'-9" " " " "
10 ⅞" - 1'-6" " " " "
20 - ¾" - 1'-8" " " for hangers & Shafting

44' × 20 - 5" belt
43 - 24" belt
27 - 12" belt

2 doors.

Cloud Engine.



150 ℔

50 revs. = 30 "
30 revs. steam
50 revs. 150 ℔
10 " steam "
50 " 300 ℔ on brake
steam raises 150 ℔ in 10 seconds
50 + 300 ℔
Figure Alone
Stop system
Remarks by Hasbrouck.

22" circumf. = say 69" at 5¾ ft. per
5.75 ft. at 50 revs. = 288 ft. per min.
say weight of brake on 22" pulley = 360 ℔
Weight of Wood weight on wheel 170 ℔ 170 ℔
Ratios of Brake alone = 500 ℔ above ℔ on ℔
(Cast iron) (Steam load)

50 ℔	= 240	+ 400	= 640	= 50 to 23
100	= 480	+ 400	= 880	= 50 to 23
150	= 720	+ 400	= 1120	= 50 to 23

185 ℔ on brake = 888 ℔ at 0.14 ft. 5 pt. revs. per min.
Standard on all = + 400 ℔ by brake weight
1288 ℔ × speed 288 ft. at 50 revs.
288
10304
10304
2576
370944 = 11½ H.P. to 12 H.P.

1 H.P. = 550 ft. lbs.

185 ℔ on brake consisting of brake weight
888 ℔ × 5¾ ft. = 0.185 H.P. at 50 revs. per min.

800 ℔ brake alone = 0.87 H.P. per min. ℔ = 800 H.P.
or at 20 revs. = — 20 rev = 1.7
at 30 revs. = — 30 rev = 2.1
at 50 " = — 50 rev = 3.5

640 ℔ at 50 revol. of 5.75 ℔ = 184,000 ℔.
640 " " 30 " " " = 110,400 " "
Due to air 73,600 " air

880 ℔ at 50 revol. of " " = 253,000 " "
880 ℔ " 23 " " " = 116,380 " steam
Due to air 136,620 " air

1120 ℔ at 50 " " = 322,000 " "
" at 2 " " = 47,120 " steam
369,120 " air

640 ℔ at 50 revol. = 5.5 H.P. =
400 ℔ at 50 " steam = 3.48 " }
240 ℔ at 50 " air = 2.09 " }
700 ℔ at 30 revol. = 2.1 H.P.

880 ℔ at 50 " = 7.66 H.P.
400 " at 50 " steam = 3.48 } =
480 " " 50 " air = 4.18 }
405 ℔ at 23 " = 1.6 H.P.

1120 ℔ at 50 " = 9.75 }
400 " 50 " steam = 3.48 } =
720 " " 50 " air = 6.27 }
400 ℔ at 2 = 0.14 H.P.

If air were not progressively expanded as it is heated, it would require 5 times as much steam as it does to perform the same work.

Air compressed quickly - $\frac{1}{5}$ gives fire - 290°
while Steam 1700 times compressed blows only 500°
Average Water absorbed in air - $\frac{1}{100}$ part.
Heat capacity (Specific Heat) for equal Volumes
Air - 1000 and Steam 1.980 at equal pressures
(Dalton) - 1.376 " Water 1.04 " expansion from 30° to 212°
(Thurston) Spec. Heat. At equal weights - air. 267 - Steam 475
or air. 1000 to Steam 1.776

Specific gravity of steam compaired with air 0.4809

At 60° - 1 Vol. steam - 75721 Vols. Volume
98 - $\frac{1}{3}$ " " - 69,372 " "
110 - $\frac{1}{4}$ " " - 16,667 " "
130 - $\frac{1}{10}$ " " - 13,255 " "
140 - $\frac{1}{15}$ " " - 7938 " "
212 - 15 " " - 1700 " "
276 - 45 " " - 610 " " with $\frac{1}{5}$ vol air at 60° &
252 - 30 " " - 875 " " combined temperature
265 " " or the steam increased
to about 1½ its Volume at $\frac{2}{5}$ its pressure
while air from 60° to 252° takes 1⅔ times its volume.

276°-3 Vol. Steam 1 = 4½ Vol. × ⅖ Press
60°-1 " Air 1 = 1½ Vol. ×

4 × 1 = 6 × ⅔ = 4

Latent Heat of Steam 990°
Specific Heat Water 1.000 - air 0.2669
774 Heat Unit — H.U.
226 cub" Air at 63° expanded to
455 cub" at 154° —

Steam reduced to 154° from Steam of ?

Air from 63° to 154° expands ~~from~~ = 70252 ft.
from 226 cb" to 282 cub inch leaving
from 455 cb" total = 173 cub" filled by steam at 154°

Steam at 154° = 4.1 lbs pressure same as shown in gauge by compressed air
Steam volume 5559 Cub ft. ~~from~~ at 154° from
" 1700 " " " 212°
Heat of Water in Kotwell = 100° at best advantage

Spec. Heat of Water 1.
" " of Steam 0.475
" " " Air - 0.267

	Latent		
Steam at 154° —	1006	total 1160	leaving (Cloud)
Water " " 212° —	966	" 1178	
" "			Steam supply
Air " 31° —	142.0		
Air - 63°			entering Cabin Top
" 154°			leaving (Cloud)

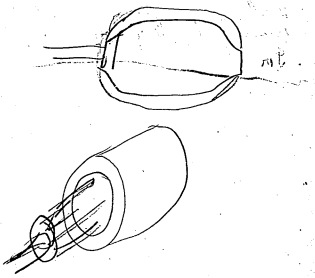
(Expansion of Air at 63° = 1.06 (at 15 lb.)
" 154° = 1.26

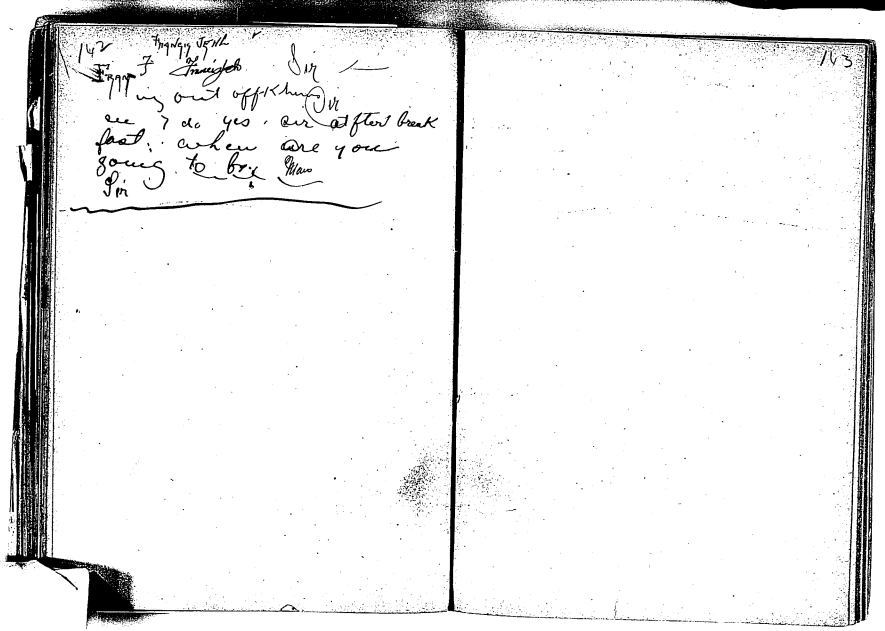
(Expansion of Steam at 154° = Vol. 5559 = 4.1 lbs. pressure
" 212° = " 1700 = 15 lb. " " "
" 63° = " 64752 = 3/4 lb. " " "

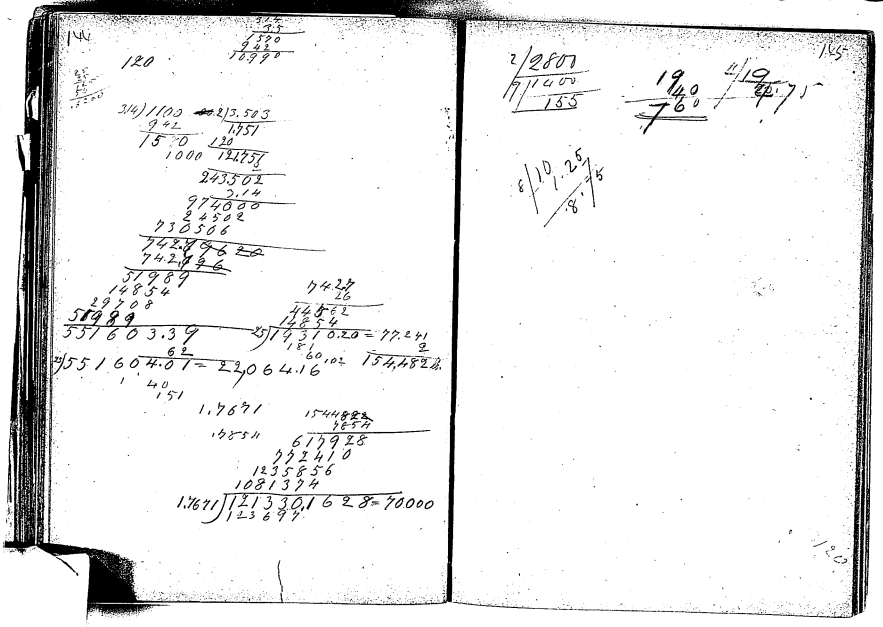
140

168 #. 53 #. 115— 55
—— 25

141







Bricks for M.L. Extension

27 × 1' × 8'	= 216	36 for windows
2 × 2½ × 8' × 8'	= 576	40 for doors
1 × 2½ × 12' × 8'	= 360	76
2 × 15' × 8'	= 240	
	1392 = 92 for openings	
	1300	
	22	
	2600	
	2600	
	26000	

Partial 2nd — 2 - 27 × 1' × 8' = 432

216	1948
432	76
360	1152
270	3364
1948	2596
22	768
2796	

26000 Bricks

2796 − 2508 = 288

36	
8	
288	

27 × 27 × 3' = 648

288

240

1170

1100

2800

2772.00

10 Hours of Engine

20 = 28 × 8 = 224 × 19 = 2016 + 228 = 2244 = 1348

3780

1893

33 = 33 = 1

6600 ℔

33000 / 22 = 1500

726 ÷ 22 = 33

14" / 5 / 70 = 14.0

80 / 24 / 1920

60 / 180

45 / 135

60 / 137

82" / 24 / 1968 / 168 / 2016 / 1440 / 288

452160 = 137

33 / 121 / 231

5 / 1 / 5

1500

5/8

40 = 17

60 / 36 / 240

Machine Shop Extension —

6 – 4"×6 – 8'-10" — 147.15'
6 – 2½"×6 – 8'-10" — 15'-6"
2 – 4"×6 – 9'-9" — 14'
2 – 2½"×6 – 9'-9" — 13'
2 – 4"×6 – 10'-3" — 13'
2 – 4"×6 – 10'-9" — 12'
2 – 4"×6 – 11' — 12'
2 – 2½"×6 – 12' — 15'
2 – 4"×6 – 11 – 10 — 12'
2 – 2½"×6 – 11 – 8 — 15'
2 – 4"×6 – 11 – 6 — 12'
2 – 2½"×6 – 11'-4 — 15'
2 – 4"×6 – 11'-3 — 12'
2 – 2½"×6 – 10'-6 — 14'
2 – 2½"×6 – 10'-7 — 14'

4"×6
✓ 10 – 12
✓ 2 – 15
✓ 2 – 14
✓ 2 – 14
✓ 2 – 13

2½"×6
✓ 2 – 13
✓ 4 – 14
✓ 6 – 15
✓ 6 – 15

2×6
8 – 4'

280.18
338.80
62.60
154.04
21.87
854.39

337.58
266.70
22.54
131.98
129.15
15.34
6.33
22.75
932.07
854.39
77.68

32.07
7
224.49
60

21'×20×5" = 420' – 57" – 237.40

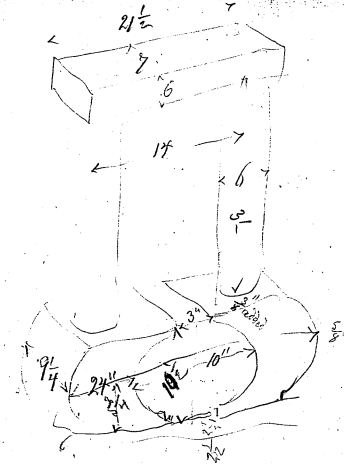
14'×20×5" cond. = 280' – 159.60

27' – 24" – 3.22

19' – 24" 60

355 : 60 = 28 : x
355 : 1200 = 48"
1005
200

150

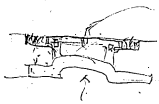


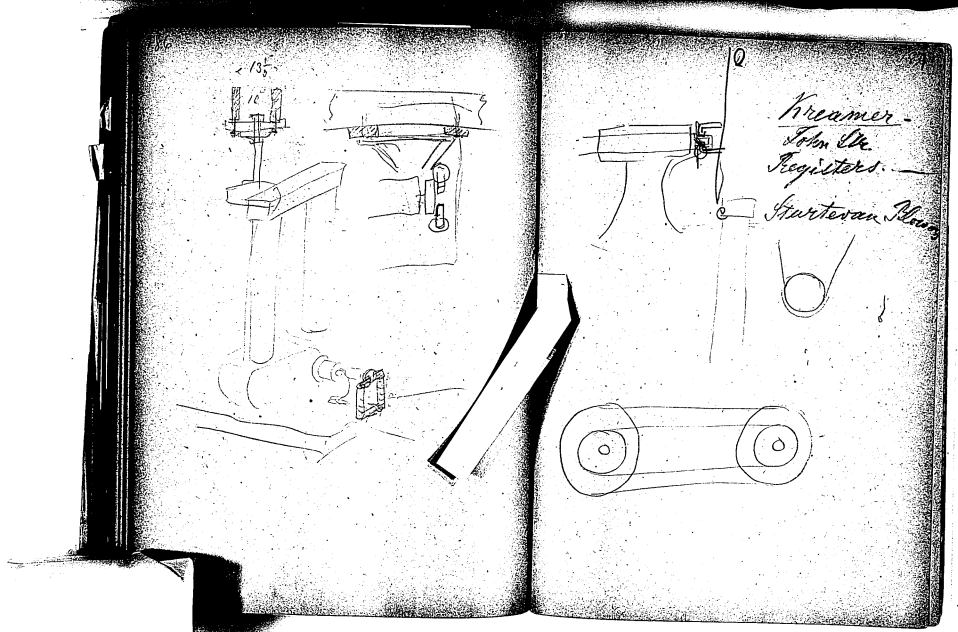
[redacted] Jan. 5th 1880 1-1

Faradic Machines 5, 6, 7, 8, 9, 10.

Diam. of bore —	9.75	10 —
" " Armature over all	9.87	9.92
" " " " iron	9.19	9.44
" " wooden core —	6.25	
" " Fibre cards.	9.67	9.92
" " Shaft.	1.75	
" " brass box outside	2 —	
" " " " iron flange	1.50	
" " " " inside —	1.50	
" " Pulley —	10 —	
" " " " Cover flange	12 —	
" " Commutator	5. —	

Armature length 9 3/4"
" to Commutator 2"
" to Pulley — 2½
Pulley — — 6"




135
10
Q
Creamer -
John Ste
Registers -
Starteven Plows

600
63
525
6
3150 acres
22.5
15750
6300
~~6300~~
~~36000 87900~~

36000 x 708750 2

36 acres
22.5
36
1350
675
315 x 810,000 acres 260
630
~~225~~ 1800

12

190

20" Diam. pulley = circumf. = 62.83

Belt contact about .25 of circumfer. = 2.1 ft.

Belt speed assumed 3150 ft. per min or 600 revs.

contant: $\frac{36000 \times 22 \text{ horsepower}}{3150} = 251.43$

$\frac{251.43}{2.1} = 120 : 6 = 20$" width of belt.

First machines, 5" belt on 10" Diam. 600 revs. representing 28 H.P., would require proportioning for large dynamos. 8" belt on 20" Diam. using about 3 times the H.P.

191

Yellow Pine timber to spare

5 – 4" × 12" – 27'

14 – 8" × 12" – 23'

6 – 8" × 10" – 12'

2 – 6" × 6" – 28'

6 – 10" × 12" – 10½'

5 – 10" × 12" – 12½'

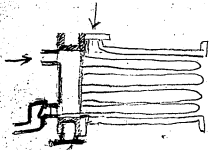
9 – 4" × 8" – 6'

4 – 4" × 6" – 4'

192

Machine Shop - Extension

6 - 7 x 6 - 8'-10" } from 4-17' and 2-15'
6 - 2½ x 6 - 8'-10" " 15'-6"
2 - 4 x 6 - 9'-9" " 14'
2 - 2½ x 6 - 9'-9" " 13'
2 - 4 x 6 - 10'-3" " 13'
2 - 4 x 6 - 10'-9" " 12'
2 - 4 x 6 - 11'- " " 12'
2 - 2½ x 6 - 12'- " 15'
2 - 4 x 6 - 11-10" " 12'
2 - 2½ x 6 - 11'-4 " 15'
2 - 4 x 6 - 11'-3 " 12'
2 - 2½ x 6 - 10'-5" " 14'
2 - 2½ x 6 - 10'-4 " 14
2 - 4 x 16 - 23' yellow pine sills
4 - 4 x 16 - 23-8 " " "
4 - 6 x 6 - 8'-10 " " from 2-28'
4 - 8 x 8 - 12'- " " 4-8x8-12'
600 sq ft 1" hemlock underfloor
600 " " 1½" yellow pine floor
700 " " Hemlock for Roof
1000 " " Siding
4 clear Pine boards 14" - 12 ft long
2 " " 12" - 15'
Yellow pine 4"x8" & 7"x6" for hanger supports



1866

Colson-Ore Mining Co.

21 Ore boxes 3' × 4½' × 5' = 60 cubft = 5 tons constant
20 Salt-Acid-vatts 2½' × 3' × 4' = 20 " "
20 Solution-vatts 2½' × 3' × 7' = 50 " make 10
10 Precipitation vatts 3' × 4½' × 5' = 60 "
Ore Bins holds 5' × 15' × 9½' = 360 " 30 tons each of 12
Water-tank 12' × 12' × 8' = at least 1000 cubft. constant.

Daily consume:
20 × 20 cubft. = 400 cubft water for Salt-Vatts
500 " " for Ore box washing
" " for diluting & washing
" " for Steam generator

2000 cubft. of Water to be lifted 40' high in Miners
300 Tons to be lifted 25' — 12 "
1000 cubft of Water at 60° to be heated to 212 degrees
1 Tons Coal daily consume or 2 cords of wood
Elevator to lift 8 tons in 2 min. 24 ft. high
with less than 10 H. P. —
150 Tons ore p. cart endless elevator.
13,440 ft-lb. per min. = full ¼ Horse power
2000 cubft Water 100' =
83.333 ft-lb. per min. = full 2½ Horse power

9000 cub ft. Water = 125000 ℔ × 40'
720 Tons ore 24' high = 268.800 ℔ × 24'
8 Tons ore p. Car 24' high in 2 min. = 6½ H. P.
Pumping Water & Ores = 3½ " " $1000
Total — 10 H. P. Engine

Total consume per day (10 hours) = 500 ℔ coal. or 2½
5.000.000 ft. ℔ for Water lift = 37 H. P. p. h. = 90 ℔ "
6.751.200 " " for Ore lift = ℔ " " = 120 ℔ "
8,60 0000 for Pump lift = 5 " " = 150 ℔
Pumps & Ores 360
140
Total for power — 500 ℔ coal
62500 ℔ day 100 000 ℔ Water to 212 = 2000 ℔ coal
2500 ℔ coal

Daily consume of coal 1 ton coal or 2 cords wood

1 Boiler for 250 ℔ coal per hour — for Wood —
= 28 ℔ sq. ft. grate = 5 ℔ ft. deep × 4 ℔ ft. wood
50 ℔ coal to Engine per hour = 50 ℔ ft. wood
1 Boiler for 10 H. P. Engine for 50 ℔ ft. wood per hour
= 28" diam shell 24 ft. wide 3' long grate
22=3" tubes - 5 ft. long. 13" diam stack
Wire ropes (1¼" circumference 3/8" diam (one ½")
Steam pump No 3 - 2" suction - 1½" discharge
¾" steam pipe 1" exhaust pipe. —

One mile track. 16# rail 25 tons at $60 = $1500

Number of ties 1760 yds = at 52 each $ 840

Splices — $ 160

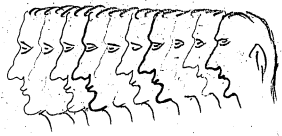
Spikes 3520 — $ 12

Total per mile for Iron & Wood = $ 2550

Rail track for inside of Mill and two outside incline tracks = 600 yards rail $ 3200

Water Barrels 10 & Pumps — $ 5000

Wirerope 1200 ft. for car hawling 1" diam. 120 keeves —



Now is the winter